Hypotension Prediction

Jules G. Bassale

Arterial Blood Pressure Variability
In Sepsis Patients

Terminology

• ABP – Arterial Blood Pressure
• Hypotension – Low Blood Pressure
• ACF – Autocorrelation Function (Time Series)

Project Overview

• A sudden episode of hypotension can lead to serious brain injuries or death.
• Sudden episode: drop of 20 mmHg within 2 min
• The ultimate goal of the project is the prediction of hypotension.

My project has two main goals:
1. Changes in ABP prior to septic shocks?
2. Can changes be detected accurately?
Project Overview

I. Difficulties & Problems Faced with ABP
   - Acute & short physiological variations
   - Patient dependency (shape, variations)

II. Approach
   - Analysis of self-similarity
   - Local Analysis of signal

Methodology

I. Selection of hypotension episodes
   - Data provided by Complex System Lab (OHSU)
   - Hypotension episodes detected by an algorithm developed by Dr. James McNames
   - 28 samples analyzed

II. Statistical Summary
   - To conduct self-similarity/local analysis, data was sliced in samples of 80 seconds

II. Statistical Summary
   - Statistical Summaries for each sample
     Help identify trend prior to hypotension

• 4 vs. 1 minute before hypotension:
  ABP shape seems to be changing!!!
Methodology
Jules G. Bassale

III. Autocorrelation Function & ABP
• Gives profile of linear correlation at different lags
• Quasi periodic signals: ACF related to the shape of signal
• ACF does not depend on initial conditions; depend on shape
• ACF is useful for self-similarity analysis
  Sensitive to local changes
  Unequal Length is ok

ACF was estimated & plotted for each sub sample

III. Statistical Inference
• ACF coefficients independent?
• Parametric or Nonparametric test?
• Kolmogorov Test
  H0: ACFs from same distribution
  H1: ACFs from different distribution
• Significance Level: 0.01

Results
Jules G. Bassale

• There is a significant change in ABP shape prior to hypotension
  p-value = 0.0001

Conclusion
Jules G. Bassale

• There is a significant change in ABP shape prior to hypotension
• So far 100% detection; selectivity test not performed yet
• ABP can be locally analyzed using ACF
• Thanks to you all ...